Remarks/Arguments

Applicant addresses Examiner's 35 U.S.C. § 112, second paragraph, rejections first and then address Examiner's other rejections in order.

I. Applicants respond to Examiner's 35 U.S.C. § 112, second paragraph, rejection of Claims 8 and 30 (Examiner's paragraphs 9 and 10)

Claims 8 and 30 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. The Examiner states that the terminology used is subjective and thus renders the claim scope unclear. *See* Office Action 3 (paragraphs 9 and 10).

Applicants have cancelled claim 8. Therefore the Examiners rejection is moot.

In response to the rejection of Claim 30, Applicants assert that the claim language is clear to one of ordinary skill in the art and respectfully disagrees with Examiner's assessment. Applicants hereby traverse the Examiner's rejection of Claim 30. Claim 30, a claim depending from Claim 26 and independent Claim 26, claims"[t]he composition of Claim 29, wherein the radioactive species is selected from the group consisting of T^+, T_2, ^3He, cobalt isotopes of small ionic radius, and combinations thereof." Applicants assert that this language is not subjective and therefore the claim scope is clear as written. The symbols "T^+", "T_2", and "^3He" are well understood to one of ordinary skill in the art to represent the Tritium atom, a Tritium molecule, and a 3-Helium atom, respectively. "Cobalt isotopes of small ionic radius" can only be derived by one of ordinary skill in the art to come from a limited and defined class of isotopes of the element cobalt (Co) that are in a nucleic range from ^{47}Co to ^{75}Co. *See* "Isotopes of Cobalt", *available at* http://en/wikipedia.org/wiki/Isotopes_of_cobalt (last viewed Dec. 27, 2006) (hardcopy included with Response).

Although not specifically pointed out by the Examiner in the rejection, Applicants believe that the Examiner specifically rejected Claim 30 on the use of the phrase "small ionic radius", and, in particular, the relative word "small". Applicants respectfully argue, however, that in the context of its dependency from Claims 26 and 29, wherein the radioactive cobalt specie of Claim 29 is

endohedrally located in the fullerene carbon nanocage, the term "small ionic radius" is defined as an ionic radius that permits the radioactive isotope cobalt specie to endohedrally fit inside the fullerene carbon nanocage created in Claims 26 and 29. The Federal Circuit has previously interpreted the use of the word "small" in a similar context where it did not define dimensions but rather function. In *Innovad, Inc. v. Microsoft Corp.*, 260 F.3d 1326, 59 U.S.P.Q.2d 1676 (Fed. Cir. 2001), the Court found that the use of the term "small volume" in a claim, in context where it was used in the specification several times to describe prior art portable telephone dialers, stood for a "comfortably portable" dialer, not one "limit[ed] . . . to a particular volume." *See Innovad*, 260 F.3d at 1332-33, 59 U.S.P.Q.2d at 1680. In essence, the Court found that the use in context defined the term to have a relative meaning of function. In this case, Applicants have used the term "small ionic radius" in a relative manner as well – in the context of Claims 26 and 29 from which Claim 30 depends. If the radioactive cobalt isotope's ionic radius is not small enough, it will not fit endohedrally inside the fullerene carbon nanocage. This defines and limits the group of cobalt isotopes from the already limited and understood class of all cobalt isotopes. As such, the use of the term "small" in the phrase "small ionic radius" is appropriate and not subjective to one of ordinary skill in the art, and therefore the scope of Claim 30 is clear and in compliance with 35 U.S.C. § 112, second paragraph.

As a result of the foregoing argument, Applicants respectfully request that the Examiner withdraw the rejection of Claim 30 under 35 U.S.C. § 112, second paragraph. If the previously subjective part of Claim 30 has not been properly identified by Applicants and argued, Applicants respectfully request that the Examiner specifically identify the particular part of Claim 30 that would continue to support a 35 U.S.C. § 112, second paragraph, rejection.

II. Applicants respond to Examiner's 35 U.S.C. § 102(e) rejection of Claims 1, 3-6, 9-15, 17, 18, 21-26, 28, 29, and 31

In paragraphs 1 and 3 of page 2, Examiner cites to and rejects Claims 21, 22, and 26 under 35 U.S.C. § 102(b) as being anticipated by Gimzewski, *et al.* (U.S. Patent 5, 547, 774) (hereinafter "*Gimzewski*"). The Examiner states in paragraph 4 that "[t]he reference teaches in fig. 2 C60 with groups on the outside and metals on the inside." Applicants respectfully traverse these

rejections.

An anticipation rejection of a claim under 35 U.S.C. § 102 requires identity of invention; each and every feature of the claim must be identified by the Examiner, either explicitly or inherently, in a single prior art reference. Further, to establish inherency, extrinsic evidence must make clear that the mission descriptive matter is necessarily present in the device or system described in the reference, and that it would be so recognized by persons of ordinary skill in the art. *In re Robertson*, 169 F.3d 743, 49 U.S.P.Q.2d 1949 (Fed. Cir. 1999). Inherency is not establish by probabilities or possibilities; the mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency. *Scaltech, Inc. v. Retech/Tetra L.L.C.*, 156 F.3d 1193, 51 U.S.P.Q.2d 1055 (Fed. Cir. 1999). The Examiner has not met this burden as to the claims of the Application.

Claim 21, as amended, claims the following:

> 21. A composition comprising:
>
> (a) a fluorine-derivatized fullerene;
>
> (b) a first species covalently attached to the fullerene; and
>
> (c) a second species endohedrally located in the fullerene.

Claim 26, as amended, claims the following:

> 26. A composition comprising:
>
> (a) fullerene carbon nanocage;
>
> (b) a first species covalently attached to the fullerene carbon nanocage, wherein the first species covalently attached to the fullerene carbon nanocage is fluorine; and
>
> (c) a second species endohedrally located in the fullerene carbon nanocage.

Applicant respectfully asserts that *Gimzewski* does not disclose either "a composition comprising a *fluorine-derivatized fullerene*" as claimed in Claim 21 or "a composition comprising . . . a first species covalently attached to the fullerene carbon nanocage, *wherein the first species covalently attached to the fullerene carbon nanocage is fluorine*" as claimed in Claim 26. *Gimzewski* does

not teach the limitations of Claims 21 and 26. The Examiner is respectfully reminded that in order to establish a *prima facie* case of anticipation, the Examiner must provide a single prior art reference that expressly or inherently describes each and every element as set forth in the claim. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). *Gimzewski* does not disclose all of the limitations of either Claims 21 or 26 and therefore does not anticipate either Claims 21 or 26.

Since the Examiner has not identified, explicitly or inherently, each and every feature claimed in independent Claims 21 and 26, the 35 U.S.C. § 102(b) rejections of Claims 21 and 26, along with the rejection of associate dependent Claim 22, must be withdrawn.

III. Applicants respond to Examiner's 35 U.S.C. § 102(e) rejection of Claims 1, 3-6, 9-15, 17, 18, 21-26, 28, 29, and 31

In paragraphs 1 and 5 of page 2, Examiner cites to and rejects Claims 1, 3-6, 9-15, 17, 18, 21-26, 28, 29, and 31 under 35 U.S.C. § 102(e) as being anticipated by Green, *et al.* (U.S. Patent 6,090,363) (hereinafter "*Green*") in view of the Rao, *et al.*, article (hereinafter "Rao"). The Examiner states in paragraph 6 that

> *Green* teaches in col. 2, 6 and the examples, opening a carbon nanotube with acid, then filling with UO2. Also taught is functionalization with bio-materials, which appear to be both inside and outside. Further, the Pd nitrate/nitric acid appears to perform internal and external modification at the same time. Claim 10 is met by the normal equilibrium of attachment and dissociation. Rao teaches in the opening paragraph that acid treatment inherently provides functional groups.

Office Action at 2. Applicants respectfully traverse these rejections.

Applicant directs Examiner to Section II and reiterates the standards required for a 35 U.S.C. § 102 rejection.

Claim 1, as amended, claims the following:

1. A method comprising the steps of:

(a) covalently attaching species to the exterior of the fullerene carbon nanocage to form a derivatized fullerene carbon nanocage, wherein the derivatized fullerene carbon nanocage is a fluorinated fullerene nanocage; and

(b) inserting an endohedral doping agent into the derivatized fullerene carbon nanocage.

Claim 17, as amended, claims the following:

17. A method comprising:

(a) derivatizing a fullerene with a fluorine specie; and

(b) endohedrally modifying the fullerene.

Claims 21 and 26 have been previously presented in Section II.

Applicant respectfully asserts that *Green*, alone or view of Rao, does not disclose "[a] method comprising . . . covalently attaching species to the exterior of the fullerene carbon nanocage to form a derivatized fullerene carbon nanocage, *wherein the derivatized fullerene carbon nanocage is a fluorinated fullerene nanocage*" as claimed in Claim 1, "[a] method comprising derivatizing a fullerene *with a fluorine specie*" as claimed in Claim 17, "a composition comprising a *fluorine-derivatized fullerene*" as claimed in Claim 21, or "a composition comprising . . . a first species covalently attached to the fullerene carbon nanocage, *wherein the first species covalently attached to the fullerene carbon nanocage is fluorine*" as claimed in Claim 26. *Green*, even in view of the Rao reference, does not teach the limitations of Claims 1, 17, 21 or 26. *Green* does not disclose all of the limitations of either Claims 1, 17, 21 or 26, and therefore does not anticipate Claims 1, 17, 21 or 26.

Additionally, Applicant respectfully asserts that *Green*, alone or in view of Rao, does not disclose "[a] method comprising . . . wherein the endohedral doping agent *decays into a radioactive species*" of dependent Claim 9. Neither *Green* or Rao explicitly or implicitly teach or discuss the use of radioactive species as the endohedral agent, let alone its decay into a radioactive species. *Green*, even in view of the Rao reference, does not teach the limitations of Claim 9 and therefore does not anticipate Claim 9.

Additionally, Applicant respectfully asserts that Green, alone or in view of Rao, does not disclose the order of steps given in Claims 12-15. Neither *Green* or Rao explicitly or implicitly teach adding to the fullerene nanocage bio-specific ligands or antibodies before or during the attaching species step wherein a derivatized fullerene carbon nanocage is formed. Neither *Green* or Rao explicitly or implicitly teach adding to the fullerene nanocage bio-specific ligands or antibodies between the attaching species step wherein a derivatized fullerene carbon nanocage is formed and inserting an endohedral doping agent into the derivatized fullerene carbon nanocage. Neither *Green* or Rao explicitly or implicitly teach adding to the fullerene nanocage bio-specific ligands or antibodies after inserting an endohedral doping agent into the derivatized fullerene carbon nanocage. *Green* only teaches adding biological matter to an opened nanotubes after derivation of the tube and not in any sort of relation or conjunction with the insertion of an endohedral doping agent as required in Claims 12-15. *See Green*, Example 6. *Green*, even in view of the Rao reference, does not teach the limitations of Claims 12-15 and therefore does not anticipate Claims 12-15.

Since the Examiner has not identified, explicitly or inherently, each and every feature claimed in independent Claims 1, 17, 21 or 26 or dependent Claims 9 and 12-15, the 35 U.S.C. § 102(e) rejections of Claims 1, 17, 21 or 26, along with the rejection of associate dependent Claims 3-6, 9-15, 18, 22-25, 28, 29, and 31, must be withdrawn.

IV. Applicants respond to Examiner's 35 U.S.C. § 102(a) and (b) rejections of Claims 1, 3-9, 16, 17, 21-23, 26, 29 and 30

In paragraphs 1 of page 2 and paragraph 7 of page 3, Examiner cites to and rejects Claims 1, 3-9, 16, 17, 21-23, 26, 29 and 30 under 35 U.S.C. § 102(a) and (b) as being anticipated by the Saunders, *et al.*, article (hereinafter "Saunders"). The Examiner states in paragraph 8 that "[t]he reference teaches, especially on pg. 1695, trapping He3 in a fullerene by high temp bombardment and functionalizing it. Also taught is closing the fullerene once the atom is inside." Office Action at 3. Applicants respectfully traverse these rejections.

Applicant directs Examiner to Section II and reiterates the standards required for a 35 U.S.C. § 102 rejection.

Claims 1, 17, 21 and 26 have been previously presented in Section II.

Applicant respectfully asserts that Saunders does not disclose a method comprising covalently attaching species to the exterior of the fullerene carbon nanocage to form a derivatized fullerene carbon nanocage, *wherein the derivatized fullerene carbon nanocage is a fluorinated fullerene nanocage* as claimed in Claim 1, a method comprising derivatizing a fullerene *with a fluorine specie* as claimed in Claim 17, a composition comprising a *fluorine-derivatized fullerene* as claimed in Claim 21, or a composition comprising a first species covalently attached to the fullerene carbon nanocage, *wherein the first species covalently attached to the fullerene carbon nanocage is fluorine* as claimed in Claim 26. Saunders does not teach the limitations of Claims 1, 17, 21 or 26. Saunders does not disclose all of the limitations of either Claims 1, 17, 21 or 26, and therefore does not anticipate Claims 1, 17, 21 or 26.

Additionally, Applicant respectfully asserts that Saunders does not disclose a method comprising adding bio-specific ligands or antibodies to the fullerene nanocage as claimed in Claim 11 or Claim 23. Saunders does not teach the limitations of either Claims 11 or 23. Saunders does not disclose, teach, or suggest adding this type of functionality before, during, or after addition of an endohedral agent. Saunders does not disclose all of the limitations of Claim 11 and 23 and therefore does not anticipate either Claim 11 and 23.

Since the Examiner has not identified, explicitly or inherently, each and every feature claimed in independent Claims 1, 17, 21 or 26 or dependent Claims 11 and 23, the 35 U.S.C. § 102(a) and (b) rejections of Claims 1, 17, 21 or 26, along with the rejection of associate dependent Claims 3-9, 16, 22, 23, 29 and 30, must be withdrawn.

IV. Applicants respond to Examiner's 35 U.S.C. § 103(a) rejections of Claims 19, 20, 32, and 33

In paragraph 2 on page 2 and paragraph 8 on page 3, Claims 19, 20, 32, and 33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Gimzewski*, *Green*, Rao, and Saunders, individually, each in further view of Luzzi, *et al.* (U.S. Patent 6,544,463) (hereinafter "*Luzzi*"). The Examiner states in paragraph 8 that "[t]he above references do not specify SWNTs. However, Luzzi teaches them as candidates for filling. Using SWNTs in the above systems is an

obvious expedient to gain favorable properties; see col 3 lines 15-25." Office Action at 3. Applicants respectfully traverse these rejections.

Regarding rejections under 35 U.S.C. § 103(a), to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *See* M.P.E.P. § 706.02(j); *see also In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). The combination of the teachings of *Gimzewski*, *Green*, Rao, and Saunders, and *Luzzi* fail to suggest derivation of a fullerene with a fluorine specie as claimed in Claim 17, the independent claim from which Claims 19 and 20 depend, or covalently attached fluorine to a fullerene carbon nanocage as claimed in Claim 26, the independent claim from which Claims 32 and 33 depend, to obtain the invention claimed by the Applicant. Claims 17 and 26 have been previously presented in Sections II and III. The combined references do not provide the suggestion or motivation for derivation of a fullerene with a fluorine specie or covalently attachment of fluorine to a fullerene carbon nanocage to achieve the method or composition claimed in Claims 17 and 26. The combined references do not indicate a likelihood of success for performing an endohedral modification of a fullerene derivatized with a fluorine specie or creating a composition comprised of a fullerene carbon nanocage with fluorine covalently attached and containing a endohedral specie internally as claimed in Claims 17 and 26, respectively. The combined references do not teach or suggest all the claims of Claim 17 and 26. The *Gimzewski*, *Green*, Rao, and Saunders references do not teach or suggest all the elements in Claims 17 or 26, as previously argued in Sections II-IV and reitterated here *in toto*, and *Luzzi* does not add any

additional teachings or suggestions to overcome the previous arguments in favor of Claim 17 and 26 to derivatize a fullerene with fluorine specie.

Applicant respectfully submits that the Examiner has not met the burden of establishing a *prima facie* case for obviousness for Claims 17 and 26. Applicant respectfully asserts that all dependent claims which depend from Claims 17 and 26, including Claims 19, 20, 32, and 33, respectively, are also not obvious and are in a condition of allowance.

Conclusion

No new matter has been added. Applicant respectfully submits that Claims 1, 3-7 and 9-26, and 28-33 as they now stand are patentably distinct over the art cited during the prosecution thereof.

With the addition of no new claims, no additional filing fees are due. However, Applicant respectfully requests a (1) One Month Extension of Time to File this Response. Enclosed with this report is Form PTO/SB/22 with Extension Fees in the amount of $60.00 as reflected on the PTO/SB/17 Fee Transmittal. However, if additional fees are due and are not included, the Director is hereby authorized to charge any fees or credit any overpayment to Deposit Account Number 23-2426 of WINSTEAD SECHREST & MINICK P.C.

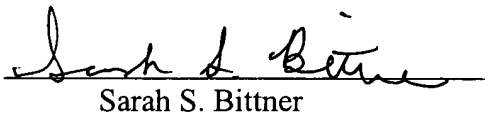
If the Examiner has any questions or comments concerning this paper or the present application in general, the Examiner is invited to call the undersigned at 713-650-2780.

Respectfully submitted,

WINSTEAD SECHREST & MINICK P.C.

Agent for Applicant

Date: January 8, 2007

By: 

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Isotopes of cobalt

From Wikipedia, the free encyclopedia

Although **cobalt (Co)** has multiple **isotopes**, only one of these isotopes is stable; as such, it is considered a monoisotopic element.
Standard atomic mass: 58.933195(5) u

Table

nuclide symbol	Z(p)	N(n)	isotopic mass (u) / excitation energy	half-life	nuclear spin	representative isotopic composition (mole fraction)	range of natural variation (mole fraction)
^{47}Co	27	20	47.01149(54)#		7/2-#		
^{48}Co	27	21	48.00176(43)#		6+#		
^{49}Co	27	22	48.98972(28)#	<35 ns	7/2-#		
^{50}Co	27	23	49.98154(18)#	44(4) ms	(6+)		
^{51}Co	27	24	50.97072(16)#	60# ms [>200 ns]	7/2-#		
^{52}Co	27	25	51.96359(7)#	115(23) ms	(6+)		
^{52m}Co	380(100)# keV			104(11)# ms	2+#		
^{53}Co	27	26	52.954219(19)	242(8) ms	7/2-#		
^{53m}Co	3197(29) keV			247(12) ms	(19/2-)		
^{54}Co	27	27	53.9484596(8)	193.28(7) ms	0+		
^{54m}Co	197.4(5) keV			1.48(2) min	(7)+		
^{55}Co	27	28	54.9419990(8)	17.53(3) h	7/2-		
^{56}Co	27	29	55.9398393(23)	77.233(27) d	4+		
^{57}Co	27	30	56.9362914(8)	271.74(6) d	7/2-		
^{58}Co	27	31	57.9357528(13)	70.86(6) d	2+		
^{58m1}Co	24.95(6) keV			9.04(11) h	5+		
^{58m2}Co	53.15(7) keV			10.4(3) µs	4+		
^{59}Co	27	32	58.9331950(7)	STABLE	7/2-	1.0000	
^{60}Co	27	33	59.9338171(7)	5.2713(8) a	5+		
^{60m}Co	58.59(1) keV			10.467(6) min	2+		
^{61}Co	27	34	60.9324758(10)	1.650(5) h	7/2-		
^{62}Co	27	35	61.934051(21)	1.50(4) min	2+		
^{62m}Co	22(5) keV			13.91(5) min	5+		
^{63}Co	27	36	62.933612(21)	26.9(4) s	7/2-		

^{64}Co	27	37	63.935810(21)	0.30(3) s	1+		
^{65}Co	27	38	64.936478(14)	1.20(6) s	(7/2)-		
^{66}Co	27	39	65.93976(27)	0.18(1) s	(3+)		
^{66m1}Co	175(3) keV			1.21(1) µs	(5+)		
^{66m2}Co	642(5) keV			>100 µs	(8-)		
^{67}Co	27	40	66.94089(34)	0.425(20) s	(7/2-)#		
^{68}Co	27	41	67.94487(34)	0.199(21) s	(7-)		
^{68m}Co	150(150)# keV			1.6(3) s	(3+)		
^{69}Co	27	42	68.94632(36)	227(13) ms	7/2-#		
^{70}Co	27	43	69.9510(9)	119(6) ms	(6-)		
^{70m}Co	200(200)# keV			500(180) ms	(3+)		
^{71}Co	27	44	70.9529(9)	97(2) ms	7/2-#		
^{72}Co	27	45	71.95781(64)#	62(3) ms	(6-,7-)		
^{73}Co	27	46	72.96024(75)#	41(4) ms	7/2-#		
^{74}Co	27	47	73.96538(86)#	50# ms [>300 ns]	0+		
^{75}Co	27	48	74.96833(86)#	40# ms [>300 ns]	7/2-#		

Notes

- Values marked # are not purely derived from experimental data, but at least partly from systematic trends. Spins with weak assignment arguments are enclosed in parentheses.
- Uncertainties are given in concise form in parentheses after the corresponding last digits. Uncertainty values denote one standard deviation, except isotopic composition and standard atomic mass from IUPAC which use expanded uncertainties.

References

- Isotope masses from Ame2003 Atomic Mass Evaluation (http://www.nndc.bnl.gov/amdc/index.html) by G. Audi, A.H. Wapstra, C. Thibault, J. Blachot and O. Bersillon in *Nuclear Physics* A729 (2003).
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  - Audi, Bersillon, Blachot, Wapstra. The Nubase2003 evaluation of nuclear and decay properties (http://amdc.in2p3.fr/web/nubase_en.html), Nuc. Phys. A 729, pp. 3-128 (2003).
  - National Nuclear Data Center, Brookhaven National Laboratory. Information extracted from the NuDat 2.1 database (http://www.nndc.bnl.gov/nudat2/) (retrieved Sept. 2005).
  - David R. Lide (ed.), Norman E. Holden in *CRC Handbook of Chemistry and Physics, 85th Edition*, online version. CRC Press. Boca Raton, Florida (2005). Section 11, Table of the Isotopes.

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Category: Isotopes